

WHAT IS CLAIMED IS:

1. A charge transfer apparatus comprising:  
a semiconductor substrate of one conductivity type;  
5 a charge transfer region of a conductivity type opposite to the conductivity type of said semiconductor substrate that is formed in said semiconductor substrate and joined to said semiconductor substrate to form a diode;  
10 a signal charge input portion adapted to input a signal charge to the charge transfer region;  
a signal charge output portion adapted to accumulate the signal charge transferred from the charge transfer region; and  
15 a plurality of independent potential supply portions adapted to supply a potential gradient to said semiconductor substrate,  
wherein the signal charge in the charge transfer region is transferred by the potential gradient formed  
20 by said plurality of potential supply portions.
2. An apparatus according to claim 1, wherein the charge transfer region is completely depleted before the signal charge is input.
- 25 3. An apparatus according to claim 2, wherein the charge transfer region is buried in said semiconductor

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substrate and forms a buried diode together with said semiconductor substrate.

4. A charge transfer apparatus comprising:

5 a semiconductor substrate of one conductivity type;

a well of a conductivity type opposite to the conductivity type of said semiconductor substrate that is formed in said semiconductor substrate;

10 a charge transfer region of a conductivity type opposite to the conductivity type of said well that is formed in said well and joined to said well to form a diode;

15 a signal charge input portion adapted to input a signal charge to the charge transfer region;

a signal charge output portion adapted to accumulate the signal charge transferred from the charge transfer region; and

20 a plurality of independent potential supply portions adapted to supply a potential gradient to said well,

wherein the signal charge in the charge transfer region is transferred by the potential gradient formed by said plurality of potential supply portions.

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5. An apparatus according to claim 4, wherein the charge transfer region is completely depleted before

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potential supply portions.

8. An apparatus according to claim 7, wherein  
each charge transfer region is completely depleted  
5 before the signal charge is input.

9. An apparatus according to claim 8, wherein the  
charge transfer region is buried in the semiconductor  
region and forms a buried diode together with the  
10 semiconductor region.

10. An apparatus according to claim 7, further  
comprising:

a conversion portion, arranged on respective  
15 columns, adapted to convert signal charges output to  
the signal charge output portions on the respective  
columns into electrical signals of an another form; and

a read-out circuit adapted to sequentially read  
out the electrical signals on the respective columns  
20 and forming an image pickup signal.

11. An apparatus according to claim 10, wherein  
said conversion portion converts the signal charge into  
an electrical signal of another form and includes an  
25 amplifier formed from an insulated-gate field effect  
transistor.

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12. An apparatus according to claim 7, wherein  
said apparatus further comprises:

charge transfer elements adapted to transfer  
signal charges output to the signal charge output  
5 portions on the respective columns; and

conversion portion, connected to final output  
stages of said charge transfer elements, adapted to  
convert transferred signal charges into electrical  
signals of an another form,

10 wherein the electrical signals from said  
conversion means are sequentially read out to form an  
image pickup signal.

13. An apparatus according to claim 12, wherein  
15 said charge transfer element includes a CCD.

14. An apparatus according to claim 7, further  
comprising:

20 lens adapted to form light into an image on the  
photoelectric conversion portions;

A/D converter adapted to convert signals from the  
signal charge output portions into digital signals; and

a signal processing unit adapted to process the  
signals from said A/D converter.

25 15. An image pickup apparatus comprising:

a semiconductor region of one conductivity type;

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photoelectric conversion portions  
two-dimensionally arrayed in the semiconductor region;  
charge transfer regions of a conductivity type  
opposite to the conductivity type of the semiconductor  
5 region that are interposed between respective columns  
of the photoelectric conversion portions and form  
junctions together with the semiconductor region;  
signal amplifier portions adapted to amplify and  
output signal charges transferred from the charge  
10 transfer regions; and  
a plurality of independent potential supply  
portions adapted to supply a potential gradient to the  
semiconductor region,  
wherein the signal charges accumulated in the  
15 photoelectric conversion portions by the potential  
gradient formed by said plurality of potential supply  
portions are input to the signal amplifier portions via  
the transfer regions, and signals amplified by the  
amplifier portions are output.

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16. An apparatus according to claim 15, wherein  
each amplifier portion is formed from a MOS transistor.

17. An apparatus according to claim 15, further  
25 comprising:

lens adapted to form light into an image on the  
photoelectric conversion portions;

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A/D converter adapted to convert signals from the  
signal amplifier portions into digital signals; and  
signal processing means adapted to process the  
signals from said A/D converter.

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